Date: Wed, 16 Jun 1999 07:35:24 -0400
From: "Dr. Richard Knight" <knightr@drexel.edu
Subject: Re: Response to Ansell Perry
In-reply-to: <v03110700b38c4d3c7da0@[144.118.36.207]
X-Sender: knightr@mail.drexel.edu
To: Tamer El-Raghy <sg94d216@drexel.edu
Message-id: <v04020a04b38d3c342051@[144.118.39.216]
MIME-version: 1.0
Content-type: text/plain; charset=us-ascii
References: <v04020a01b38c6a94db85@[144.118.39.222]

Michel and Tamer,

Here (below) is what I propose to send back to Ansell Perry. Please feel free to add/change/amend as you see fit before I send it off to them.

Thanks,

Rick

Attn: Stan Gromelski.

X-ray diffraction has been carried out on three ceramic glove formers coated with Ti3SiC2 in order to try to understand the behavior of the material under the different use and accelerated testing conditions evaluated by Ansell Perry. Results were as follows:

Sample	Condition	XRD Results
X	As-sprayed	TiSi2 TiC Ti3SiC2
A	H2SO4 treated/KOH tested	TiC TiSi2 Ti3SiC2
B	KOH tested only	TiC TiSi2 Ti3SiC2

The column headed "XRD Results" refers to the intensity of the major peaks detected, and indicates that some decomposition of the Ti3SiC2 material has occurred during (i) spraying, and (ii) chemical treatment and KOH solution testing. In all three samples an unidentified phase was also present in the XRD spectra.

Clearly a visual examination of the samples after your KOH accelerated test shows that the coatings have begun to dissolve, as indicated by the increased smoothness of the coated formers after KOH testing, and by exposure of the underlying ceramic former in areas where the coatings were thinnest.

The presence of TiSi2 in the coatings has its origins in the SHS process used to produce the powders, and is an intrinsic conseqence of this production route. Until very recently

this was our only source of the Ti3SiC2 material in large enough quantities (ie amounts of several pounds) and in a powdered form suitable for spraying. Professor Barsoum now has an alternative source which utilizes a different process, which results in a much purer material, with much lower TiSi2 content. To date, however, we have not sprayed the latter material, and cannot be certain that (i) it is sprayable using the same parameters as before, and (ii) that some decomposition to TiC will not occur, however, neither of these should be major stoppers. I think the main issue is compatibility of the Ti3SiC2 material itself with your KOH solution. To that end I propose that Dr. Barsoum send you a small piece of "bulk" Ti3SiC2 produced by reactive sintering for you to subject to your KOH accelerated test cycle so that we can determine how the bulk material performs. If this test is successful then it would point towards the need to use the purer starting material, and to carry out some further spray parameter development work with the goals of producing adherent, dense coatings with minimal decomposition during spraying.

Sincerely,

➢ Richard Knight